KERN BUCKWHEAT
Eriogonum kennedyi var. *pinicola*

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Management Status: Federal: USFWS Species of Concern
California: S1.1; G4T1 (CDFG, 1998)
CNPS: List 1B, R-E-D Code 3-3-3 (Skinner and Pavlik, 1994)

General Distribution:

All records for the Kern buckwheat come from Kern County, California. There are between four and six documented populations of this plant in the Tehachapi Mountains from Cache Peak south to Middle Knob, but most location descriptions are such that we can't tell exactly which reports pertain to which populations. Rutherford (1998) specifies that there are four populations, but other sources seem to indicate that there may be at least six. Two additional occurrences were reported by George Lawrence in 1984 and 1985 (CNDDB, 1997). One was north of Pajuela Peak (Tehachapi NE quad) and the other was south of Highway 58 (Monolith quad) but the variety identification was never verified. Sandy Hare (1995) commented that her site observations indicate the habitat at these locations is not suitable for Kern Buckwheat and that Lawrence's description of the plants seen, based on a conversation they had in 1995, does not match that of Kern Buckwheat. Whatever the identity of these two occurrences, they were both eliminated by wind energy development in the late 1980s (Hare, 1995).

Distribution in West Mojave Planning Area:

All known populations are in the WMPA. There are two to four populations on public land and one or two on private land. All are located either: west of Middle Knob and south of Pine Tree Canyon, or on Sweet Ridge. On private land, there are two populations on Sweet Ridge, but all others are on BLM managed land.

Rutherford (1998) discusses four populations along Mananga Road, east of Sand Canyon, and implies that these are all that is known. These locations are not identified by coordinates or other standard map features, but can be described as follows:

Population A – "Near" Zond Windfarms transmitting Station; a 2-5 acre site in a basin below the station.

Population B – On Zond property; a 1 acre site, bisected by the road.

Population C – On BLM managed land ca. 1/2 mile south of population B; a 2-3 acre site, bisected by the road.

Population D – On BLM managed land about 3 miles south of population C; perhaps 4 to 5 acres.

Natural History:

This cushion-form shrub in the buckwheat family (Polygonaceae) was originally described by Reveal (1968) from plants collected at Sweet Ridge, south of Cache Peak by E.C. Twisselmann in 1966. Kern buckwheat grows as a low dense cushion or mat, but when flowering sends up inflorescences 2-5 in. (5-13 cm) high. The plant spreads over a small circle of ground from a woody base above a stout taproot. The short branches hold many small leaves**,** 0.12-0.2 in. (3-5 mm) long**,** which are densely grayish to rusty-white felty on both sides and which densely cover the stems. The inflorescence consists of a leafless peduncle (flowering stem) that supports a single head of white to reddish flowers, with green to reddish midribs, at the tip. The flowers are perfect (have both male and female parts). Kern buckwheat is distinguished from most other mat-forming buckwheat species within its range (except var. *purpusii*) by its solitary heads of white flowers. Kern buckwheat has gray to rusty leaves while *Eriogonum kennedyi* var. *purpusii* has white leaves (Hickman, 1993). Kern buckwheat is only found in white clay soils of pebble plains (Hare, 1995).

Fruit ripens and is dispersed in about July. Seed dispersal does not appear to have been studied, but Stokes (1936) thought that birds may play a role in the dispersal of all *Eriogonum* seeds based on various observations of birds and their behaviors. She thought that seeds stored in the crop of a bird killed by a predator might serve to establish new populations in areas distant from existing populations. She also mentioned wind, rain and streams as dispersal agents, but there appears to have been little data available to support these ideas. Given the extremely restricted distribution of Kern buckwheat, it is not clear that long-distance dispersal has ever occurred and it certainly does not appear to be a common phenomenon.

Pollination of this plant has not been studied, but small silvery-white, iridescent butterflies (Lycaenidae?) have been observed visiting the flowers (Hare, 1995), and may be its pollinators. It is certainly probable that Kern buckwheat is insect pollinated, but whether the butterflies observed are effective pollinators is unknown. The flowers fade to pink or rose at maturity (probably after pollination) and bloom from May through June. The flower color change to shades of red suggests that the pollinator may be a bee -- pure red is invisible to bees and shades (to us) of red appear as very different colors to bees (Barth, 1985). Many bee pollinated species have flowers that change to red after pollination. For example, many lupines develop a red spot on the banner after pollination (e.g., Faegri and van der Pijl, 1979). This change can make flowers invisible to the bees, or at least make them appear very different, thus signaling the lack of nectar or pollen and thus preventing potential damage to developing ovules by useless flower visitors. It is suspected that such color changes may also be seen by other potential insect pollinators, but such has apparently not been demonstrated (Barth, 1985). In any event, the color change very strongly suggests that some insect is involved in pollination.

Habitat Requirements:

Kern buckwheat is found in poorly draining depressions in white bentonite clay soils thought to be from volcanic ash (Uli and Schiffman, 1984). These depressions have pebbles, gravel and rock cemented into the soil surface. These exposed "pebble plains" are found on ridge tops and saddles between knolls. Kern buckwheat is associated *Layia glandulosa*, *Mimulus androsaceous*, *Calochortus kennedyi* and *Allium cratericola*. Species found at the edges of the pebble plain include Jeffrey pine (*Pinus jeffreyi*) and single-leaf pinyon (*Pinus monophylla*). All plant species that grow on or within 30 feet of the pebble plains are smaller than average. Kern

buckwheat is never found on red or dark brown soil and never in loamy soils. While Reveal (1989) reported an elevational range of 4900-5600 ft (1500-1700 m), the existing documented populations occur from 5400-6200 ft (1600-1900 m) elevation (CNDDB, 1997).

Kern buckwheat seems to share many general ecological characteristics with the other varieties of *E. kennedyi*. It is a perennial herb of open areas that appears intolerant of extensive shading, preferring full sunlight. It is not a species well adapted to competing for light, but it is very competitive on sites where tall and fast growing species are excluded by moisture deficiencies, wind, and winter cold. The compact "cushion" habit probably serves to reduce moisture loss on the windy ridges as is true for other species of similar life form (Walter, 1973). The short annual growth intervals and consequent low stature makes all races of *E. kennedyi* poor competitors on sites that are capable of supporting tall or dense vegetation. However, sites where moisture stress is combined with high insulation are highly favorable for plants such as this one.

Another major ecological factor is the winter climate. Low growing cushion species, such as Kern buckwheat, are likely to be covered by snow during the period of the year when soil moisture is unavailable because the ground is frozen, and when, in arid areas, the humidity of the air may still be very low. When covered with snow, Kern buckwheat is subjected to less moisture stress than it would be if exposed to the dry air -- relative humidity is probably at virtually 100% and wind effects are excluded. That moisture and not light is probably a controlling factor for this species is evidenced by the fact that the foliage is densely covered with tomentum (wool). Dense pubescence is commoner on mature foliage in drier environments and can greatly reduce the amount of light striking the leaf tissue (Johnson, 1975). This pubescence may affect photosynthesis, but it also forms a layer of dead air at the leaf surface, which can reduce water loss due to wind, though the magnitude of this effect apparently varies greatly with the species being considered and appears not to have been studied under conditions of air movement (e.g., Johnson, 1975). Detailed studies of the ecophysiology of this species would be very valuable.

Population Status:

Only four to six populations of this plant are known to exist, all in the Tehachapi Mountains. Hare (1995) estimated 400 plants total based on observations in the early 1990s, but based on surveys in 1998 Rutherford (1998) estimated the total population as about 10,000 individuals distributed among four populations. Much of the occupied area is rugged and poorly explored, so it must be considered possible that additional populations could exist on unexplored ridge tops in the area.

Rutherford noted (1998) that the populations contained individuals of various age classes, and that it appeared the populations were reproductively healthy. Some individuals were seen to be over 2-4 ft (1 m) in diameter and were surmised to be very old.

Threats Analysis:

This species is currently threatened by maintenance of wind energy facilities, off highway vehicle (OHV) use, and possible future construction (Hare, 1995; Rutherford, 1998). The northeast portion of the one acre population on private land on Sweet Ridge was destroyed by the construction of wind energy facilities (Hare, 1995; Rutherford, 1998). Approximately half the population, 50 plants (Hare, 1995) to 500 or more (Rutherford, 1998), was destroyed by this construction. Additional habitat was destroyed, along with some plants, during construction of access roads to newly subdivided lots and construction of a ramp to a proposed camp site for the

Pacific Crest Trail (Hare, 1995). Illegal grading at Rutherford's population D has resulted in a continuing erosion problem that threatens part of one population (Rutherford, 1998). There is a rumor that BLM has plans to build a campsite on the Pacific Crest Trail that would destroy the population at the southern end of Sweet Ridge. While there is no current known cattle grazing around the populations, the area has been used for cattle grazing in the past. Future cattle grazing, construction, logging or mining could potentially threaten the remaining populations (Skinner and Pavlik, 1994).

Observations by Sandy Hare indicate Kern buckwheat has been unable to recolonize disturbed areas (Hare 1995). Due to a restricted distribution and small number of remaining plants, this species is vulnerable to stochastic extinction.

Biological Standards:

The number, extent and condition of populations needs to be determined as soon as possible. Careful extensive survey of all apparently suitable habitat areas is needed immediately. With portions of populations already destroyed by Wind Park development and road construction, the need for careful range and habitat assessment is obvious. Listing as threatened or endangered may discourage future development on BLM land, but may do little for populations on private land. Consideration should be given to notifying private landowners of the existence of this rare species, where it is, and how to prevent future disturbance. Soil disturbance could be reduced by restricting vehicle access to roads and trails through the habitat, or by preventing vehicles from leaving the road by physical barriers. At least, jeep trails should be closed when they are wet. If the rumor that BLM intends to construct a campsite at the site of one of the populations is accurate, this plant should either be abandoned or the proposed location altered to a less sensitive site. Perhaps the populations on public lands can be protected by the fact that each population occurs on a recorded archaeological site (Robinson, 1982; Uli and Schiffman, 1984; Whitley, 1991). Due to the proximity to the Pacific Crest Trail, it is recommended that BLM put up signs asking hikers to stay off the pebble plains because they are a rare habitat.

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